

medicine," he says, though he naively confesses in excuse for his charlatanism that, not having had any regular medical training, "*I know I made a very dangerous doctor, but I was obliged to go on as a pedant domineering over a society of ignoramuses*"—this is very fine, and worthy of being preserved! Fortunately for Mr. Kawaguchi, the Dalai Lama himself became one of those ignoramuses, and conferred on the "doctor" his intimacy and confidence. But Mr. Kawaguchi is strangely silent as to the subjects of those interesting conversations, beyond the bold general statement that

"I heard and saw much of him (the Grand Lama) and had frequent interviews with him. I judge that he is richer in thoughts political than religious. He seems to fear the British most, and is always thinking how to keep them from Tibet."

Living in constant terror of being robbed explains, perhaps, the low opinion our traveller has formed of his Tibetan co-religionists—so widely different from the experience of sympathetic Western travellers like Rockhill and others. He says:—

"It is impossible to trust oneself entirely to Tibetans, for honesty is observed only among people who are known to one another, and only so long as actions are done before the public gaze. Social restraints are no sooner removed than the Tibetan is ready for any crime or enormity" (!).

Our pious priest, therefore, was perpetually inventing falsehoods to deceive his interlocutors, and to "lay false scents," as he terms it.

When the secret of his disguise leaked out, that he was not a Chinaman, but a Japanese, he tells us that he made a "bolt" from Lhasa to India, assisted by an "ex-Minister and his nun-wife (*sic*). As there was no pursuit, however, his excitement on the way was perhaps more imaginary than warranted. Certainly we cannot say that he has brought back to us any information which is new or important.

The get-up of the book is not at all creditable. It is in the poorest Indian style—it was printed in Madras, and looks it. Misprints also abound, and there is no index. The illustrations have been roughly drawn by a draughtsman in Japan in conventional Japanese style, and exhibit little that is characteristic of Tibet.

We leave the book with the feeling that the really interesting things have been left out.

L. A. WADDELL.

CRITICISM IN GEOLOGY.

La Géologie générale. By Prof. Stanislas Meunier. Pp. xii+344. Second edition. (Paris: Félix Alcan, 1909.) Price 6 francs.

Evolution géologique de la Terre et ancienneté de l'Homme. By Alphonse Cels. Pp. viii+248. (Brussels: Lebegue et Cie., 1909.) Price 5 francs.

THE one point common to these two treatises is that both authors look with a certain enthusiasm on the earth as an active living whole. Prof. Meunier claims that his originality consists in this. For forty

years he has worked towards the expression of a theory of the earth, in which the guiding idea is that

"Le globe est un véritable organisme, où des appareils harmonieusement associés poursuivent la réalisation de fonctions dont l'ensemble se traduit par les progrès d'une évolution planétaire sans arrêt."

The rocks of the earth's crust are in a state of continuous transformation; the characters of a stratum belong to all the ages that have passed since the time of its deposition.

To the mind of the geologist in these islands there is nothing very new in the propositions so clearly set forth in the author's "avertissement," and developed in the work. Some of them, such as the mode of production of flint in limestone (p. 104), and the part played by rain in the excavation of valleys (p. 162), deserve emphasising in lecture-rooms where other views may have prevailed. But they seem rather home-truths nowadays, and are, unfortunately, associated in the book with much that has been discarded in the face of cumulative evidence, and with much that must be characterised as exaggeration of a special point of view. Prof. Meunier, for instance, seems to regard oolitic structure as essentially of secondary origin in the rocks in which it occurs (p. 120); he denies, somewhat late in the day, the glacial origin of the Dwyka conglomerate and similar contemporaneous deposits (p. 277); and, while urging that springs and waterfalls tend inevitably to recede, he minimises the excavating action of a river throughout its ordinary course. Even where we are all prepared to follow him, his triumphal progress is accompanied by too much slaying of the slain. Yet here, as in his previous works, his comments on current explanations of phenomena are always well worth reading. The appearance of a river in a valley as the result of the excavation of the floor down to the surface of the permanent water-table is not new to students of English "bournes"; but it gives one food for thought when applied to larger and permanent cases.

The production of a volcano (p. 74) by the faulting up of a hot region over one saturated with water is distinctly fascinating. The essay (pp. 96-103) on "alluvions verticales," including the South African diamond pipes, has novelty, at any rate, in its treatment of the subject. The essay by Montlosier on the erosion of volcanic relics in Auvergne, published in 1788, was well worthy of resuscitation (p. 158), and forms an interesting feature of a chapter in which full justice is also done to Poulett Scrope. Prof. Meunier has always maintained the community of origin of volcanic and plutonic igneous rocks of various ages; but we doubt if the diagram on p. 82 will gratify students of differentiation. Mr. R. A. Daly, to whom igneous rocks are all basic to begin with, will regard it almost with dismay.

Prof. Meunier's remarks on the relics of the latest—and to him the only—ice-age have a Lyellian ring, but will not satisfy the growing school of glacial investigators. While he rightly urges that considerable areas remained free from ice, though others became for a time concealed, he can hardly convince us nowadays that the glacial epoch was a local phenomenon,

shifting from place to place under changes of geographical conditions. Twenty years ago many of us may have said the same, particularly if we lived where glacial relics were not abundant. Travel and conference with others have wrought a great change in this respect, and we may venture to think that Prof. Meunier still prefers to remain a critic rather than a field-observer. His volume is a pleasure to read, for he has the happy manner of an essayist; but it is full of pitfalls for the beginner. It contains, moreover, too many misprints, and is not provided with an index.

M. Cels, fortified in his geology by long and numerous quotations from De Launay's "La Science géologique," rejoices as a giant to run his course. He reminds us at all points of the sailor who, hearing for the first time of an essential fact of sacred history, left the meeting-house and knocked down an unoffending Jew. M. Cels has discovered the Huttonian doctrine; for him, as for Prof. Meunier, the world lives and is subject to evolution (p. 29); but he looks in vain (p. 247) for the traces of a beginning or of an end. Consequently, in the light of this great truth, all geologists, and notably the late M. de Lapparent, seem to him but as blind guides. Lamarck and Darwin (p. 39) have deceived enthusiastic men of science by presuming a beginning of life, from which our existing organic structures spread.

The author's devotion to causes now in action (p. 46) is that of a convert won by faith. With the earlier and not the later Lyell, he would lay enormous stress on the imperfection of the record, and would trace man back beyond the "eoliths" of early Eocene times (pp. 202 and 219). With the early Huxley, he would urge that strata containing the same fossil types in different parts of the globe may be separated by great intervals, even of geological time; and he further believes that the similarity of faunas is due to similarity of conditions of environment rather than to any contemporaneity in time. Prof. Meunier dislikes the idea of a general glacial epoch, on the ground that the earth's climates have got steadily colder; how then, he asks, shall we account for the disappearance of an epoch colder than that in which we now live? M. Cels dislikes it because he believes in the shifting of our polar axis (p. 107) and in the sufficiency of this vital earth to manage all its own affairs. Yet it is interesting to find Prof. Meunier employing the same arguments for demolishing the glacial epoch (p. 274 of his work) as M. Cels employs against the idea of successive geological periods marked by faunas in course of evolution.

M. Cels, during his recent reading, has discovered many valuable things, such as the occurrence of true sediments among archæan masses, and the difficulty of finding any relics of the primordial crust—facts pointed out long ago by Sir A. Geikie, but which are here dated back only to 1905. His studies among the modernists throw him, however, more and more towards Hutton, and even towards Pythagoras (p. 232), and his hope is to reform geology altogether. Both these books are out of the common; but neither is quite so stimulating as Reyer's "Prinzipienfragen," which was reviewed in these columns in 1908.

GRENVILLE A. J. COLE.

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CHEMICAL PHILOSOPHY.

The Fundamental Principles of Chemistry. An Introduction to all Text-books of Chemistry. By Prof. W. Ostwald. Authorised translation by Harry W. Morse. Pp. xii+349. (London: Longmans, Green and Co., 1909.) Price 7s. 6d. net.

SINCE the retirement of Prof. Ostwald from the directorship of the Institute of Physical Chemistry in Leipzig, his literary activity appears to have increased, although for many years his output has been phenomenally great. With his departure from the atmosphere of the laboratory, from the sphere of attraction of experimental problems, the philosophic, pedagogic and historical aspects of chemical science have claimed his attention more closely than was possible heretofore.

The present work is essentially philosophical in character. In a sense it is an attempt to work out a system of chemistry without reference to the properties of individual substances, and its chief characteristic consists in a minute analysis of various chemical conceptions, and of the facts of experience from which they are derived.

The range of analysis is indicated by the titles of the separate sections:—Bodies, substances and properties; the three states; mixtures, solutions, and pure substances; change of state and equilibrium; solutions; elements and compounds; the law of combining weights; colligative properties; reaction velocity and equilibrium; isomerism; and, finally, the ions.

At the outset the author takes the view that the conception of matter is unnecessary, and this term is not made use of in the text. The idea that matter is something originally existing, something which is at the basis of all phenomena, and in a sense independent of them, is very widely spread, and any attempt to get rid of the conception will have to show a clear gain in simplicity, so far as derived concepts are concerned, before chemists agree to discard this particular conception. Such gain is not demonstrated, and the author's assertion that matter can be shown to be made up of the simpler concepts weight, mass and volume will doubtless be objected to on the ground that weight is not a conception of a simpler order than matter.

About half the book is taken up by the chapters on solutions and elements and compounds. A good deal seems to be made of the fact that pure substances can be regarded as limiting cases of solutions. Two component systems are subjected to a somewhat laborious analysis, and numerous diagrams are given to illustrate the various types of possible phase combinations. Chief interest attaches, however, to the demonstration that there are two component mixtures and solutions—viz. those which admit of hylotropic transformation—which behave exactly like pure substances in respect of such change. These solutions can, however, be readily differentiated from pure substances, for the hylotropy of the former is limited to certain definite temperatures and pressures, whereas that of the latter extends over considerable ranges of these variables.

The relationships involved in hylotropy are made